

2 EXP 10 +/- log +/-

Therefore

$$\begin{aligned} \text{pH} &= -\log_{10} [\text{H}^+] \\ &= -\log_{10} [2 \times 10^{-10}] \\ &= -(-9.7) \\ &= 9.7 \end{aligned}$$

TABLE 12.7 The pH Values of Some Common Solutions

	Solution	pH
Acidic	Stomach acid ($0.1 \text{ mol} \cdot \text{L}^{-1} \text{ HCl}$)	1.0
	Vinegar	2.5
	Urine (depending on diet)	5.0-7.0
Basic	Blood	7.3-7.5
	Milk of Magnesia (saturated $\text{Mg}(\text{OH})_2$)	10.3

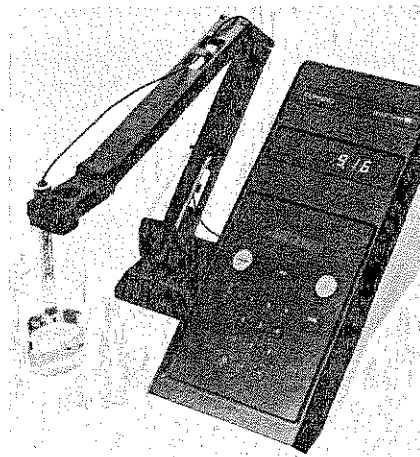


Figure 12.14

We can measure the pH of a solution by using a pH meter. The digital model shown measures pH by means of an electrode dipped in the solution.

When comparing the pH values of two solutions, it is important to remember that a difference of 1 pH unit represents a tenfold difference in hydrogen-ion concentration. Thus, in a solution with a pH of 4.0, the concentration of hydrogen ions is ten times greater than in a solution with a pH of 5.0. The Richter scale for measuring the strength of earthquakes is somewhat similar: an earthquake that registers 6 on the Richter scale is ten times stronger than one that registers 5 on the same scale.

QUESTIONS

- Calculate the pH of
 - a $2.0 \times 10^{-3} \text{ mol} \cdot \text{L}^{-1}$ nitric acid solution
 - a $2 \times 10^{-5} \text{ mol} \cdot \text{L}^{-1}$ sodium hydroxide solution
- Arrange the following substances in order of increasing acidity:

Lemon juice, pH 2.1	Egg white, pH 7.8
Cow's milk, pH 6.5	Shampoo, pH 6.7

Figure
Average
America

Acid Rain

12.13

Acid rain was mentioned in Section 9.7 in the discussion of sulfur dioxide. In recent years, the problem of acid rain has become a very controversial issue.

So called "pure" rainwater is slightly acidic because it contains dissolved carbon dioxide. Thus, "pure" rainwater is really a very dilute solution of carbonic acid:

